THE RESOURCES AGENCY OF CALIFORNIA

Department of Water Resources

BULLETIN No. 91-8

DATA ON WATER WELLS AND SPRINGS IN THE RICE AND VIDAL VALLEY AREAS

RIVERSIDE AND SAN BERNARDINO COUNTIES, CALIFORNIA

Prepared by

UNITED STATES DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

FEDERAL-STATE COOPERATIVE GROUND WATER INVESTIGATIONS

MAY 1963

HUGO FISHER	EDMUND G. BROWN	WILLIAM E. WARNE
Administrator	*Governor*	*Director*
The Resources Agency of California	State of California	Department of Water Resources

State of California

THE RESOURCES AGENCY OF CALIFORNIA

Department of Water Resources

BULLETIN No. 91-8

DATA ON WATER WELLS AND SPRINGS IN THE RICE AND VIDAL VALLEY AREAS

RIVERSIDE AND SAN BERNARDINO COUNTIES, CALIFORNIA

Prepared by

UNITED STATES DEPARTMENT OF INTERIOR

GEOLOGICAL SURVEY

FEDERAL-STATE COOPERATIVE GROUND WATER INVESTIGATIONS

MAY 1963

HUGO FISHER
Administrator
The Resources Agency of California

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
Department of Water Resources

This report is one of a series of open file reports prepared by the United States Department of Interior Geological Survey, Ground Water Branch, which presents basic data on wells obtained from reconnaissance surveys of desert areas. These investigations are conducted by the Geological Survey under a cooperative agreement whereby funds are furnished equally by the United States and the State of California. The reports in this Bulletin No. 91 series are being published by the Department of Water Resources in order to make sufficient copies available for use of all interested agencies and the public at large. Earlier reports of this series are:

Bulletin No. 91-1
Data on Wells in the West Part of the Middle Mojave Valley Area, San Bernardino County, California

Bulletin No. 91-2
Data on Water Wells and Springs in the Yucca Valley-Twentynine Palms Area, San Bernardino and Riverside Counties, California

Bulletin No. 91-3
Data on Water Wells in the Eastern Part of the Middle Mojave Valley Area, San Bernardino County, California

Bulletin No. 91-4
Data on Water Wells in the Willow Springs, Gloster, and Chaffee Areas, Kern County, California

Bulletin No. 91-5
Data on Water Wells in the Dale Valley Area, San Bernardino and Riverside Counties, California

Bulletin No. 91-6
Data on Wells in the Edwards Air Force Base Area, California

Bulletin No. 91-7
Data on Water Wells and Springs in the Chuckwalla Valley Area, Riverside County, California

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division
Ground Water Branch
Sacramento 14, California

February 11, 1963

Mr. William E. Warne, Director
California Department of Water Resources
P. O. Box 388
Sacramento 2, California

Dear Mr. Warne:

We are pleased to transmit herewith, for publication by the Department of Water Resources, the U.S. Geological Survey report,"Data on Water Wells and Springs in the Rice and Vidal Valley Areas, Riverside and San Bernardino Counties, California," by F. W. Giessner.

This report, one of a series for the Mojave Desert region, was prepared by the Long Beach subdistrict office of the Geological Survey in accordance with the cooperative agreement between the State of California and the Geological Survey. It tabulates all available data on wells and springs in the Rice and Vidal Valley areas and shows reconnaissance geology with special reference to the water-yielding deposits.

Sincerely yours,

Fred Kunkel

Fred Kunkel
District Geologist

CONTENTS

ILLUSTRATIONS

(All illustrations are at end of report)

TABLES

DATA ON WATER WELLS AND SPRINGS IN THE RICE AND VIDAL VALLEY AREAS, RIVERSIDE AND SAN BERNARDINO COUNTIES, CALIFORNIA

By F. W. Giessner

PURPOSE AND SCOPE OF THE STUDY

The desert areas of southern California, of which the Rice and Vidal Valleys are a part (fig. 1), are broad valleys or basins that have been partly filled by alluvial deposits and are surrounded by nearly barren mountain ranges. These basins contain ground water that varies widely in chemical quality and is potentially available for development for irrigation, industrial, and domestic supply.

The objective of the investigation was the collection and tabulation of all available hydrologic data for use in planning orderly development and utilization of the ground-water resources, as well as providing a basis for subsequent detailed ground-water studies.

Fieldwork by the U.S. Geological Survey in the area included: (1) A very brief reconnaissance of the major geologic features to define the extent and general character of the deposits that contain ground water; (2) an inventory and examination of virtually all the water wells in the area to determine and record their locations in relation to geographic and cultural features and the public-land net, and to record the depths and sizes of the wells, the types and capacities of installed pumping equipment, uses of the water, and other pertinent information; (3) the measurement and recording of the depth to the water surface in wells, below established and described measuring points at or near the land surface; (4) the selection of representative wells and the periodic measurements of water level in these wells in order to detect changes of water levels; and (5) the collection and compilation of well records, including well logs, water-level measurements, and chemical analyses.

This study has been made by the U.S. Department of the Interior, Geological Survey, as a part of the cooperative program with the California Department of Water Resources to investigate the ground-water resources of the desert areas. Fieldwork and preparation of the report have been under the general supervision of Fred Kunkel, district geologist in charge of ground-water investigations in California, and under the immediate supervision of G. M. Hogenson, geologist in charge of the Long Beach subdistrict office.

LOCATION AND GENERAL FEATURES OF THE AREA

Rice and Vidal Valleys are located in the desert region of southern California between long 114°30' and 114°57' W. and lat 33°52' and 34°20' N. The boundaries as shown on figures 1 and 2 include all or parts of the following U.S. Geological Survey and Army Map Service topographic quadrangle maps at a scale of 1:62,500: Big Maria Mountains, Midland, Rice, Savahia Peak, Turtle Mountains, and Vidal. (See index map on fig. 2.)

The total area of Rice and Vidal Valleys, as described in this report (fig. 1), consists of about 710 square miles. Individually, the two valleys are approximately equal in area, each containing about 355 square miles.

Access to the area is provided by U.S. Highway 95, the Parker Dam Highway and the unpaved Rice to Midland road.

Rice Valley is an area of internal drainage with no perennial streams. It consists of a nearly circular alluviated valley bounded on the south by the Little Maria and the Big Maria Mountains. The western boundary is formed by the Arica Mountains which are separated from the Little Maria Mountains to the south and the Turtle Mountains to the north by low alluviated drainage divides. The Turtle Mountains provide the northern boundary of the basin and are separated by an alluviated drainage divide from the West Riverside and Riverside Mountains which mark the eastern extent of the area.

Vidal Valley is also an area of internal drainage with no perennial streams. It is a valley of irregular shape, bounded on the south by the West Riverside and Riverside Mountains, on the west by the Turtle Mountains, and on the north by the Turtle and Whipple Mountains. The eastern boundary of the valley is formed by the Colorado River; however, the area of study does not extend eastward to include this portion of the valley. The east edge of the Vidal quadrangle lies approximately 0.5 mile east of Vidal and is used to define the eastern boundary of the area of study.

GEOLOGIC AND HYDROLOGIC FEATURES

The geologic units in the Rice and Vidal Valley areas are grouped into two broad categories: consolidated rocks and unconsolidated deposits.

The consolidated rocks include the metamorphic and igneous intrusive rocks of pre-Tertiary age that form the basement complex, and some undifferentiated volcanic rocks of Tertiary(?) and Quaternary(?) age. The volcanic rocks consist mainly of basalt flows. Some are of felsic composition. The consolidated rocks are not water bearing, except for minor amounts of water contained in cracks and residuum.

The extent of the volcanic rocks, shown on figure 2, is based primarily on aerial photographs. Therefore, some areas designated as basement complex may be locally overlain by volcanic rocks. Also, isolated areas of basement complex may be included in the area mapped as volcanic rocks.

The unconsolidated deposits consist of sedimentary material deposited in a continental environment, mainly during Quaternary time. Most of the material was waterlain as alluvial-fan, stream-channel, lake, or playa deposits, but some of the sand was deposited by the wind. Six units, shown on figure 2, make up the unconsolidated rocks. These are the older alluvium, the lacustrine deposits, and the fan deposits, all of Pleistocene age; the younger alluvium, the playa deposits, and the windblown sand, all of Recent age.

The lacustrine deposits of Pleistocene age consist of bentonitic clay interbedded with very fine sand and silt. The deposits are flat-lying, moderately indurated, and, locally, dissection has resulted in vertical exposures of as much as 50 feet. The absence of coarse fragmental material and the presence of clay interbedded with fine sand and silt differentiates the lacustrine deposits from the overlying alluvial fans. These deposits would probably yield only small amounts of water to wells.

The older alluvium is of Pleistocene age and consists of fine to coarse sand interbedded with gravel, silt, and clay. The color ranges from dark brown to red, with numerous small white nodules of caliche which give it a speckled appearance. The older alluvium yields water freely to wells and probably is the most important aquifer in the area.

The fan deposits of Pleistocene age are poorly sorted and consist of boulders, very coarse to fine gravel, sand, silt, and clay. The fans extend into the valley from the surrounding mountains and are characterized by local areas of well-developed desert pavement. This deposit is generally above the water table and is not considered to be a water-bearing unit. Where saturated, the fan deposits may yield small amounts of water to wells.

The younger alluvium of Recent age consists of poorly sorted gravel, sand, silt, and clay. This deposit is permeable, but it overlies many of the geologic units in the Rice and Vidal Valley areas as a thin veneer and is believed to be mostly above the water table. If saturated, the deposit probably would yield water freely to wells.

The playa deposits of Recent age consist mainly of clay, silt, and sand. They are relatively impermeable and probably will not yield water readily to wells.

The windblown sand of Recent age consists of actively drifting sand and some dunes which are anchored by vegetation. This unit mainly occupies the lower elevations of the valleys and varies in thickness from 0 to 15 feet. The deposit apparently is above the water table at all localities and is not considered to be a water-bearing unit.

The source of recharge to Rice and Vidal Valleys is primarily precipitation that falls on the surrounding mountain ranges. Since the annual precipitation for this desert area is approximately three inches or less, the runoff from the adjacent mountains contributes only a small amount of recharge. Some of the surface runoff is lost due to evaporation, but some percolates into the unconsolidated deposits at the edges of the valley floors and is added to the ground-water basin.

A small amount of ground water may enter Rice Valley as underground inflow from Ward Valley, an adjacent connecting valley.

Twenty-eight wells and springs were inventoried in the Rice and Vidal Valley area. Data for these wells and springs are listed in tables 1 through 3, and their locations are shown on figure 2. Measured water levels by the U.S. Geological Survey in Rice Valley range from 285 feet below land surface in well 3S/21E-18D1 and 181 feet below land surface in well 2S/21E-28N1 to 151 feet below land surface in well 1S/21E-32B1. A small gradient toward the southeast is indicated by these three water-level measurements, and subsurface outflow may occur from Rice Valley through the alluvial drainage divide between the Riverside Mountains and the Big Maria Mountains. Measured water levels in Vidal Valley range from 267 feet below land surface in well 1N/23E-8D1, near Vidal junction, to 246 feet below land surface in well 1N/23E-36R1 at Vidal.

Three wells have been selected as representative to show the range of long-term water-level fluctuations in different parts of the area. Complete records for wells 1S/21E-32B1, 1S/23E-1A2, and 1N/23E-8D1 are shown in table 1.

PREVIOUS WORK AND ACKNOWLEDGMENTS

Data on ground water and geology in Rice and Vidal Valleys are contained in reports by the Geological Survey (Brown, 1920, p. 63-65, and 1923, p. 99-101, 260-261, 280-283; Lee, 1908, p. 18, 65-66; Mendenhall, 1909, p. 79; Thompson, 1929, p. 711-715, 741-747); and the California Department of Public Works (1954, p. 39, 46, 59).

The cooperation given by well owners and other persons who furnished information for this investigation contributed materially to the preparation of this report and is gratefully acknowledged. The California Department of Water Resources, the Riverside County Flood Control District, and the San Bernardino County Flood Control District provided all the pertinent information in their files.

WELL-NUMBERING SYSTEM

The well-numbering system used in the area described in this report has been used by the Geological Survey in California since 1940. It has been adopted by the California Department of Water Resources and by the California Water Pollution Control Board for use throughout the state.

Wells are assigned numbers according to their location in the rectangular system for the subdivision of public land. For example, in the number 1N/23E-8D1 the part of the number preceding the slash (/) indicates the township (T. 1 N.); the number following the slash indicates the range (R. 23 E.); the number following the hyphen (-) indicates the section (sec. 8); the letter following the section number indicates the 40-acre subdivision of the section as shown in the diagram below:

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

Within the 40-acre subdivision, the wells are numbered serially as indicated by the final digit. Thus, well 1N/23E-8D1 is the first well to be listed in the $NW\frac{1}{4}NW\frac{1}{4}$ sec. 8. Because the Rice and Vidal area is traversed by the San Bernardino base and meridian, the letters N and S are used to indicate whether the well lies north or south of the base line. The letter E indicates that the entire area is east of the San Bernardino meridian.

For well numbers where a Z has been substituted for the letter designating the 40-acre subdivision, the Z indicates that the well is plotted from unverified location descriptions. The indicated sites of such wells were visited but no evidence of a well could be found.

Springs are numbered according to the same system as wells, except that the letter s has been substituted for the final digit in the number.

REFERENCES CITED

Brown, J. S., 1920, Routes to desert watering places in the Salton Sea region, California: U.S. Geol. Survey Water-Supply Paper 490-A, 86 p., 7 pls., 2 figs.

____________ 1923, The Salton Sea region, California: U.S. Geol. Survey Water-Supply Paper 497, 283 p., 19 pls., 18 figs.

California Department of Public Works, Division of Water Resources, 1954, Ground water occurrence and quality, Colorado River basin region: Water Quality Inv. Rept. no. 4, 59 p., 9 tables, 11 pls.

Lee, W. T., 1908, Geologic reconnaissance of a part of western Arizona: U.S. Geol. Survey Bull. 352, 96 p., 11 pls., 16 figs.

Mendenhall, W. C., 1909, Some desert watering places in southeastern California and southwestern Nevada: U.S. Geol. Survey Water-Supply Paper 224, 98 p., 4 pls.

Thompson, D. G., 1929, The Mohave Desert region, California; a geographic, geologic, and hydrologic reconnaissance: U.S. Geol. Survey Water-Supply Paper 578, 759 p., 34 pls., 20 figs.

Table 1.--<u>Data on water wells and springs in the Rice and Vidal Valley areas, California</u>

<u>USGS number</u>: The number given is the Geological Survey number assigned to the well or spring according to the system described in the text.

<u>Source of data and other numbers</u>: The source of the data and observations on each line is indicated by the following symbols: <u>DWR</u> State of California, Department of Water Resources; <u>GS</u> Geological Survey, or reported by owners, drillers, or others; <u>MWD</u> Metropolitan Water District of Southern California; and <u>WSP</u> U.S. Geological Survey Water-Supply Papers 497 (1923) by J. S. Brown and 578 (1929) by D. G. Thompson; where no symbol is given, the source of data is the same as indicated on the preceding line. Numbers following the letter symbol <u>MWD</u> indicate the number of that well as used by that agency.

<u>Date of observation</u>: Data for each well are presented in reverse chronological order, with the most recent information summarized on the top line, opposite the well number.

<u>Owner or user</u>: The name given is that of the owner or user of the well or spring on the date indicated. In some instances, the local name of the well or spring is given.

<u>Year completed</u>: The year the well was completed was obtained from the driller's log or reported by the owner or others.

<u>Depth</u>: Depths given in feet and tenths were measured below land-surface datum by the Geological Survey; depths given in whole feet were reported by owners, drillers, or others.

Type of well and diameter: The type of well construction is indicated by the following symbols: C cable tool, D dug. The number following the letter is the diameter of the casing or pit in inches.

Pump type and power: The type of pump and(or) method of lift is indicated by the following symbols: L lift, N none, S submersible, T turbine. The type of power is indicated as follows: G gasoline engine, N none; a number in this column indicates electric power and gives the rated horsepower of the motor.

Yield: The yield or output of the pump, in gallons per minute, is usually reported by the well owners or drillers. It is not necessarily the maximum capacity of the well or the installed pump.

Use: Dm domestic, Ds destroyed or dry, and Un unused.

Measuring point: The point from which water-level measurements by the Geological Survey are made is described as follows: Bhc bottom of hole in casing, Hpb hole in pump base, Ls land surface, Na no access, Tap top of access pipe, Tc top of casing, Tcc top of casing cover, Tf top of flange. The suffix letters N, S, E, W, indicate the side--north, south, east, or west--from which the measurement is made. The distance of the measuring point above or below (-) land-surface datum is given in feet and tenths and sometimes hundredths. All measurements of water level are from the same measuring point, unless otherwise indicated; however, not all the measuring points used by others are known.

Altitude: The figure given indicates the altitude, in feet above mean sea level, of the land-surface datum at the well site. This plane of reference is approximately at ground surface. Altitudes were interpolated from Geological Survey topographic maps.

Water level: Measured depths to water level are given in feet, tenths, and sometimes hundredths; reported or approximate depths to water are given in whole feet. The water-level measurements are below land-surface datum. For these measurements, the difference in altitude between land-surface datum and the measuring point has been subtracted from the measured water level.

Other data: C chemical analysis given in table 3; L log of well given in table 2.

USGS number	Source of data and other numbers	Date of observation	Owner or user	Well data: Year completed	Well data: Depth (ft.)	Well data: Type, diameter (in.)	Well data: Pump type and power	Well data: Yield (gpm)	Well data: Use	Measuring point	Measuring point (feet)	Altitude of lsd (feet)	Water level: Depth below lsd (feet)	Other data
			T. 1 N., R. 20 E.											
1N/20- 1B1	GS	6-19-62			18.1	D 47	N N		Ds	Tc	2.0	2,400	Dry	
			T. 1 N., R. 21 E.											
1N/21- 5A1	GS	5- 9-62	Turtle Mountain Mining Co.		23.9	D 32	N N		Un	Tcc	3.0	2,040	11.89	C
5A2	GS	5- 9-62	Horn Spring Turtle Mountain Mining Co.		51.2	6	N N		Un	Tc	.5	2,040	14.29	
29Ms	GS	5-15-62										1,640	Dry	

USGS number	Source of data and other numbers	Date of observation	Owner or user	Well data: Year completed	Well data: Depth (feet)	Well data: Type, diameter (in.)	Well data: Pump type and power	Well data: Yield (gpm)	Well data: Use	Measuring point	Measuring point (feet)	Altitude of lsd (feet)	Water level: Depth below lsd (feet)	Other data
			T. 1 N., R. 23 E.											
1N/23- 5N1	GS	6-18-62	Metropolitan Water District of Southern California (MWD)			16	N N		Ds			960		
5P1	GS	3-28-62	MWD	1933	190.0	8	N N		Ds	Tc	1.0	960	Dry	C,L
	MWD-13	1933			785			100						
8D1	GS	3-28-62	MWD	1933	503.9	16	N N		Un	Tc	5.72	960	267.32	C,L
	MWD-14	9- 5-33			621			90					267	
8D2	GS	6-18-62	MWD		147.1	9	N N		Ds	Tc	1.5	960	Dry	
9E1	GS	3-28-62	State of California	1948	670	C 8	L N	28	Un	Na		930		C,L
9E2	GS	5-16-62	William Claypool	1952	300	6	S 1	11	Dm	Tcc	1.0	930	236	C
	DWR	5-15-57											a237.8	
		10- 1-55											235.0	
		5-25-55											234.9	
		9-16-54											236.5	
		5-11-54											235.3	
36R1	GS	3-28-62	H. Oxnevad		291.0	10	N N		Un	Tc	2.0	640	246.35	
		12-13-61											246.54	

			T. 2 N., R. 23 E.														
2N/23- 7D1	GS	5-13-62	Cascade Gold Mine #1		103.4	D	70	L	N			Un	Tc	0	1,720	61.66	C
			T. 3 N., R. 21 E.														
3N/21-28Qs	GS b/	6-22-62	Mopah Spring												2,235		
			T. 1 S., R. 20 E.														
1S/20-14L1	GS Owner	3-29-62 1910	Atchison, Topeka, & Santa Fe Rwy (AT&SF)	1910	575		10	N	N			Un	Na		930	 450	C,L
14Z1	MWD-12	1933	MWD	1933	657		16					Ds			950	370	C,L
			T. 1 S., R. 21 E.														
1S/21-19G1	GS DWR	3-27-62 9-17-54			293.6		8	N	N			Ds	Tc Tc	1.0 1.0	880	Dry 311.8	
32B1	GS	3-27-62	J. H. Roberts		175	C	16	T	G			Un	Hpb	1.5	740	150.65	
32B2	GS	8-24-62	J. H. Roberts		153.6	C	18	N	N			Un	Tc	.4	740	152.06	
			T. 1 S., R. 23 E.														
1S/23- 1A1	GS Owner	5- 8-62 3-28-62 12-13-61 1924	AT&SF, well 2	1924	685		16	T		7½	63	Dm	TapE	1.0	627	241.4 258.05 239.28 230	C,L

See footnotes at end of table.

USGS number	Source of data and other numbers	Date of observation	Owner or user	Well data: Year completed	Well data: Depth (feet)	Well data: Type, diameter (in.)	Well data: Pump type and power	Well data: Yield (gpm)	Well data: Use	Measuring point	Measuring point (feet)	Altitude of lsd (feet)	Water level: Depth below lsd (feet)	Other data
			T. 1 S., R. 23 E.--Continued											
1S/23- 1A2	GS	3-28-62	AT&SF, well 1		348.5	10	N N	55	Un	Tc	2.95	627	241.20	C,L
		12-13-61								Tcc	0		240.77	
	WSP-578				412								250	
			T. 1 S., R. 24 E.											
1S/24- 6E1	GS	3-28-62	Fred Brown	1949	180.1	8	N N		Ds	Tc	0	615	Dry	
6F1	GS	3-28-62			211.2	6			Ds	Tc	0	615	Dry	
			T. 2 S., R. 20 E.											
2S/20- 8B1	GS	3-27-62	Priests Well		143.3	10	N N		Ds	Tc	-4.3	985	Dry	C
	WSP-497	10-30-17	Assets Realizing & Mining Co.		587				Dm				507	
11Z1	WSP-578		Grays Well									730	137	
16P1	GS	3-29-62	Browns Well		233.0	D	N N		Ds	Ls	0	890	Dry	C
	WSP-578				304		L G						297	
			T. 2 S., R. 21 E.											
2S/21-28N1	GS	7-21-62	Fred McCoy	1956	500	C 12	N N		Un	Tc	.3	750	181.5	C

			T. 3 S., R. 20 E.										
3S/20-13J1	GS WSP-497	3-29-62	Gypsum Well	1914	107.0 585	12 12	N	N G	Ds	BhcW	3.0	910	Dry 125
			T. 3 S., R. 21 E.										
3S/21-18D1	GS	3-29-62				15	N	N	Un	TfE	1.0	885	284.99

a. Well being pumped.
b. Spring not visited.

Table 2.--Drillers' logs of wells

1N/23E-5P1. Metropolitan Water District of Southern California, well 13. Altitude about 960 ft. Drilled by owner in 1933. 8-inch casing, perforated 312-340 and 520-600 ft. Yield 100 gpm.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Gravel	6	6	Clay	128	366
Clay, cemented	8	14	Clay, blue, and "sea shells"	36	402
Sand and gravel	12	26	Clay, blue	118	520
Clay, hard	141	167	Clay, hard, flinty	80	600
Sand, packed	13	180	Shale, hard	185	785
Clay, cemented	50	230			
Sand, packed	8	238			

1N/23E-8D1. Metropolitan Water District of Southern California, well 14. Altitude about 960 ft. Drilled by owner in 1933. 16-inch casing, perforated 296-366 and 475-603 ft. Yield 90 gpm. Well backfilled to 621 ft.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil	4	4	Clay, soft, muddy, and water	42	340
Clay, cemented	76	80	Clay, blue	101	441
Clay	37	117	Clay, blue, and shells	55	496
Clay, cemented	25	142	Shale, broken, sand and water	28	524
Sand, packed, and gravel	18	160	Clay, hard, blue	34	558
Clay, cemented	26	186	Shale, hard, blue	45	603
Sand, packed, and gravel	4	190	"Blow sand"	1	604
Clay, hard	30	220	Clay	20	624
Sand, packed	10	230	Clay, blue	5	629
Clay, soft	58	288			
Clay, hard, flinty	10	298			

1N/23E-9E1. State of California, Department of Agriculture. Altitude about 930 ft. Drilled by Rex Roberts in 1947-48. 8-inch casing. Yield 28 gpm.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Gravel	20	20	Sand, dry	3	425
Sand, packed	113	133	Sand and clay	100	525
Clay, yellow, sandy	77	210	Clay, blue	20	545
Clay, white, sandy	42	252	Sandstone	10	555
"Water sand"	8	260	Sand and clay	25	580
Clay, white, sandy	10	270	Clay, blue, hard	50	630
Shale, blue, sea shells	10	280	"Water sand"	18	648
Sand, dry	108	388	Clay, blue	4	652
Shale, blue, sandy	6	394	"Water sand"	18	670
Sand and shale "breaks"	28	422			

1S/20E-14L1. The Atchison, Topeka, and Santa Fe Railway System. Altitude about 930 ft. Drilled by Arizona and California Railway Co. in 1910. 10-inch screw-pipe casing.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Gravel, coarse, and malapai boulders ---	300	300	Clay ------------	105	540
Sand, fine, loose ----	70	370	Quicksand & water	15	555
Gravel, sand, & water	65	435	Clay & limestone boulders ------	20	575

1S/20E-14Z1. Metropolitan Water District of Southern California, well 12. Altitude about 950 ft. Drilled by owner in 1933. 16-inch casing.

Topsoil --------------	4	4	Sand, gravel, and clay ------	25	451
Clay, cemented -------	18	22	Clay ------------	73	524
Clay, sandy, hard ----	118	140	Clay, blue ------	40	564
Clay, sandy, soft ----	178	318	Clay ------------	78	642
Gravel, packed, & boulders -----------	108	426	Clay, cemented, and sand ------	15	657

1S/23E-1A1. The Atchison, Topeka, and Santa Fe Railway System, well 2. Altitude about 627 ft. Drilled by Roscoe Moss Co. in 1924. 16-inch casing to 614 ft, perforated 245-255, 375-385, 500-505, 595-605 ft. Yield 63 gpm with 50 ft drawdown.

Sand and gravel ------	20	20	Shale -----------	218	600
Sand, gravel, and boulders -----------	63	83	Gravel ----------	5	605
Clay -----------------	117	200	Clay, white -----	5	610
Shale, sandy ---------	25	225	"Cement gravel"	12	622
Shale ----------------	153	378	Granite, decomposed	53	675
"Shell rock" ---------	4	382	Malapi ----------	10	685

1S/23E-1A2. The Atchison, Topeka, and Santa Fe Railway System, well 1. Altitude about 627 ft. Drilled by owner. 10-inch screw-pipe casing to 265 ft, 8-inch to 385 ft, perforated 320-385 ft. Yield 55 gpm.

Sand, loose, and gravel -------------	225	225	Clay, blue -------	20	360
Clay, blue -----------	85	310	Shale, sandy -----	40	400
Sand, loose ----------	30	340	Clay, blue -------	12	412

Table 3.--Chemical analyses of water from wells

The calculated values of dissolved solids were computed from the sum of determined constituents by the Ground Water Branch, U.S. Geological Survey. Values for sodium preceded by the letter a indicate a combination of sodium and potassium. Values preceded by the letter b were calculated by the Ground Water Branch. Values preceded by the letter c indicate a combination of calcium and magnesium.

Analyzing laboratory: AT&SFRy Atchison, Topeka, and Santa Fe Railway; San Bernardino, Calif.; DWR California Department of Water Resources, Los Angeles, Calif.; MWD The Metropolitan Water District of Southern California, Los Angeles, Calif.; SBCFCD San Bernardino County Flood Control District, San Bernardino, Calif.

Well number	1N/21E-5A1	1N/23E-5P1		
Date of collection	5-9-62[3]	4-19-33	3-28-33	3-26-33
Results in parts per million				
Silica (SiO_2)	28			
Iron (Fe)				
Calcium (Ca)	170			
Magnesium (Mg)	44			
Sodium (Na)	92			
Potassium (K)	10			
Bicarbonate (HCO_3)	265			
Carbonate (CO_3)	0			
Sulfate (SO_4)	147			
Chloride (Cl)	312	139		
Fluoride (F)	.7			
Nitrate (NO_3)	11			
Boron (B)	.20			
Dissolved solids				
Calculated	946			
Residue on evaporation at 180°C	1,090	660	650	612
Hardness as $CaCO_3$	605	74	74	57
Noncarbonate hardness as $CaCO_3$	388			
Percent sodium	25			
Specific conductance (micromhos at 25°C)	1,620			
pH	7.5			
Temperature (°F)	73			
Depth of well (feet)	23.9	190.0	190.0	190.0
Analyzing laboratory	DWR	MWD	MWD	MWD
Laboratory number	R4479			

See footnotes at end of table.

Well number	1N/23E-8D1	1N/23E-9E1	
Date of collection	9-16-33	1-8-51	12-13-50
Results in parts per million			
Silica (SiO_2)			
Iron (Fe)			
Calcium (Ca)		7.0	7.0
Magnesium (Mg)		2.0	2.0
Sodium (Na)		158	158
Potassium (K)			
Bicarbonate (HCO_3)		166	166
Carbonate (CO_3)		0	0
Sulfate (SO_4)		85	85
Chloride (Cl)	148	112	112
Fluoride (F)			
Nitrate (NO_3)		3.5	3.5
Boron (B)		.30	.30
Dissolved solids			
Calculated		450	450
Residue on evaporation at 180°C	610	458	458
Hardness as $CaCO_3$	55	26	
Noncarbonate hardness as $CaCO_3$			
Percent sodium		93	
Specific conductance (micromhos at 25°C)		800	800
pH		8.0	
Temperature (°F)			
Depth of well (feet)	503.9	670	670
Analyzing laboratory	MWD	SBCFCD	DWR
Laboratory number			128

Well number	1N/23E-9E2				
Date of collection	6-6-62	5-15-61	9-15-60	5-17-60	9-10-59
Results in parts per million					
Silica (SiO_2)		15	30		
Iron (Fe)					
Calcium (Ca)		23	21		
Magnesium (Mg)		4.3	10		
Sodium (Na)		190	182		
Potassium (K)		3.4	7.0		
Bicarbonate (HCO_3)	80	83	81	81	79
Carbonate (CO_3)		0	0	0	0
Sulfate (SO_4)	152	171	168		
Chloride (Cl)		158	182	157	154
Fluoride (F)		.9	.9		
Nitrate (NO_3)		17	5		
Boron (B)		.36			
Dissolved solids					
Calculated		624	646		
Residue on evaporation at 180°C		615	620		
Hardness as $CaCO_3$	71	74	95	75	75
Noncarbonate hardness as $CaCO_3$	5	6	28		10
Percent sodium		84	79		
Specific conductance (micromhos at 25°C)		1,040	1,020	1,020	1,050
pH	8.0	7.7	8.2	7.5	8.1
Temperature (°F)					
Depth of well (feet)	300	300	300	300	300
Analyzing laboratory	DWR	DWR	DWR	DWR	DWR
Laboratory number	L2756	12631	L280	11547	R2803

Well number	1N/23E-9E2			
Date of collection	5-17-59	9-5-58	5-9-58	5-15-57
Results in parts per million				
Silica (SiO_2)		20	13	20
Iron (Fe)		0		
Calcium (Ca)		23	26	21
Magnesium (Mg)		4.0	7.0	5.0
Sodium (Na)		190	182	182
Potassium (K)		3.4	3.5	3.1
Bicarbonate (HCO_3)	79	83	95	86
Carbonate (CO_3)	0		0	0
Sulfate (SO_4)		171	189	153
Chloride (Cl)	154	159	143	156
Fluoride (F)		.8	.7	.8
Nitrate (NO_3)		26	13	15
Boron (B)		.24	.90	.32
Dissolved solids				
Calculated		638	625	598
Residue on evaporation at 180°C		625	634	583
Hardness as $CaCO_3$	75	75	95	74
Noncarbonate hardness as $CaCO_3$	10	7		
Percent sodium		84	80	b84
Specific conductance (micromhos at 25°C)	1,040	1,030	1,000	1,030
pH	7.5	7.9	7.8	7.3
Temperature (°F)				
Depth of well (feet)	300	300	300	300
Analyzing laboratory	DWR	DWR	DWR	DWR
Laboratory number	R2550	9742	T1844	7871

Well number	1N/23E-9E2				
Date of collection	10-17-56	5-30-56	5-23-55	9-16-54	5-11-54
Results in parts per million					
Silica (SiO_2)					
Iron (Fe)					
Calcium (Ca)				26	28
Magnesium (Mg)				3.0	2.7
Sodium (Na)				191	179
Potassium (K)				3.5	3.2
Bicarbonate (HCO_3)	78	87	137	82	77
Carbonate (CO_3)	0	0	0		0
Sulfate (SO_4)				178	176
Chloride (Cl)	153	154	152	167	149
Fluoride (F)				1.2	.8
Nitrate (NO_3)				16	19
Boron (B)				.65	.35
Dissolved solids					
Calculated				626	596
Residue on evaporation at 180°C				610	574
Hardness as $CaCO_3$	75	77		76	80
Noncarbonate hardness as $CaCO_3$					
Percent sodium				84	82
Specific conductance (micromhos at 25°C)	1,030	1,060	922	1,050	1,020
pH	7.8	8.2	7.9	8.0	8.1
Temperature (°F)				85	86
Depth of well (feet)	300	300	300	300	300
Analyzing laboratory	DWR	DWR	DWR	DWR	DWR
Laboratory number	7386	7033	5767	R388	P523

Well number	2N/23E-7D1	1S/20E-14L1	1S/20E-14Z1
Date of collection	5-13-62[3]	7-2-10[2]	4-26-33
Results in parts per million			
Silica (SiO_2)	27		
Iron (Fe)			
Calcium (Ca)	176	56	
Magnesium (Mg)	62	44	
Sodium (Na)	118	658	
Potassium (K)	3.9		
Bicarbonate (HCO_3)	278		
Carbonate (CO_3)	0		
Sulfate (SO_4)	53	692	
Chloride (Cl)	472	656	769
Fluoride (F)	.5		
Nitrate (NO_3)	8.1		
Boron (B)	.24		
Dissolved solids			
Calculated	1,060		
Residue on evaporation at 180°C	1,320	2,170	2,340
Hardness as $CaCO_3$	695	321	266
Noncarbonate hardness	468		
Percent sodium	27		
Specific conductance (micromhos at 25°C)	1,920		
pH	7.8		
Temperature (°F)	73		
Depth of well (feet)	103.4	575	657
Analyzing laboratory	DWR	AT&SFRy	MWD
Laboratory number	R4478	10807	

See footnotes at end of table.

Well number	1S/23E-1A1				
Date of collection	6-6-62	5-15-61	5-17-60	5-17-59	9-5-58
Results in parts per million					
Silica (SiO_2)	24				
Iron (Fe)					
Calcium (Ca)	14	15			
Magnesium (Mg)	2	0			
Sodium (Na)	207	205			
Potassium (K)	1.5	2.0			
Bicarbonate (HCO_3)	69	56	88	70	80
Carbonate (CO_3)	2	5	0	0	0
Sulfate (SO_4)	134	178			
Chloride (Cl)	164	163	161	163	161
Fluoride (F)	3.4	9.6			
Nitrate (NO_3)	0	.5			
Boron (B)	1.0	1.0			
Dissolved solids					
Calculated	636	607			
Residue on evaporation at 180°C	628	630			
Hardness as $CaCO_3$	43	38	45	43	42
Noncarbonate hardness as $CaCO_3$	0	0			
Percent sodium	91	92			
Specific conductance (micromhos at 25°C)	1,040	1,050	1,060	1,080	1,090
pH	8.3	8.2	8.0	8.0	8.3
Temperature (°F)		93	90		
Depth of well (feet)	685	685	685	685	685
Analyzing laboratory	DWR	DWR	DWR	DWR	DWR
Laboratory number	L2853	12660	R3234	R2549	T2599

Well number	1S/23E-1A1			
Date of collection	5-9-58	5-17-57	10-17-56	5-30-56
Results in parts per million				
Silica (SiO_2)	26		30	
Iron (Fe)				
Calcium (Ca)	14		14	
Magnesium (Mg)	1.0		2.0	
Sodium (Na)	202		200	
Potassium (K)	3.1		2.4	
Bicarbonate (HCO_3)	79	62	68	5
Carbonate (CO_3)	0	0	0	56
Sulfate (SO_4)	175		170	
Chloride (Cl)	175	166	163	163
Fluoride (F)	1.8		9.0	
Nitrate (NO_3)	0		.7	
Boron (B)	.32		.96	
Dissolved solids				
Calculated	637		625	
Residue on evaporation at 180°C	687		648	
Hardness as $CaCO_3$	40	37	40	38
Noncarbonate hardness as $CaCO_3$				
Percent sodium	91		b90	
Specific conductance (micromhos at 25°C)	1,080	962	1,030	1,070
pH	7.7	7.4	7.9	8.5
Temperature (°F)				
Depth of well (feet)	685	685	685	685
Analyzing laboratory	DWR	DWR	DWR	DWR
Laboratory number	T1856	8073	7385	7040

Well number	1S/23E-1A1			
Date of collection	10-1-55	5-24-55	6-13-29[2/]	4-2-27[2/]
Results in parts per million				
Silica (SiO_2)				
Iron (Fe)				
Calcium (Ca)	15	13	244	
Magnesium (Mg)	1.0	3.0		
Sodium (Na)	210	205	372	203
Potassium (K)	2.0	2.0		
Bicarbonate (HCO_3)	54	44		
Carbonate (CO_3)	12	7	33	
Sulfate (SO_4)	174	175	197	207
Chloride (Cl)	164	167	167	160
Fluoride (F)	9.0	9.0		
Nitrate (NO_3)	0	4.5		
Boron (B)	1.2	.98		
Dissolved solids				
Calculated	615	608		
Residue on evaporation at 180°C	634	625	660	622
Hardness as $CaCO_3$	40	45		
Noncarbonate hardness as $CaCO_3$				
Percent sodium	b91	90		
Specific conductance (micromhos at 25°C)	995	960		
pH	8.7	8.7		
Temperature (°F)				
Depth of well (feet)	685	685	685	685
Analyzing laboratory	DWR	DWR	AT&SFRy	AT&SFRy
Laboratory number	6135	5762	29540	25949

See footnotes at end of table.

Well number	1S/23E-1A2	2S/20E-8B1
Date of collection	8-11-10	10-30-17[1/]
Results in parts per million		
Silica (SiO_2)		28
Iron (Fe)		1.1
Calcium (Ca)	c22	82
Magnesium (Mg)		29
Sodium (Na)	216	a811
Potassium (K)		
Bicarbonate (HCO_3)	132	95
Carbonate (CO_3)		0
Sulfate (SO_4)	176	766
Chloride (Cl)	164	842
Fluoride (F)		
Nitrate (NO_3)		2.6
Boron (B)		
Dissolved solids		
Calculated	643	2,610
Residue on evaporation at 180°C	642	2,690
Hardness as $CaCO_3$	55	324
Noncarbonate hardness as $CaCO_3$		
Percent sodium		
Specific conductance (micromhos at 25°C)		
pH		
Temperature (°F)		
Depth of well (feet)	348.5	143.3
Analyzing laboratory	AT&SFRy	
Laboratory number		

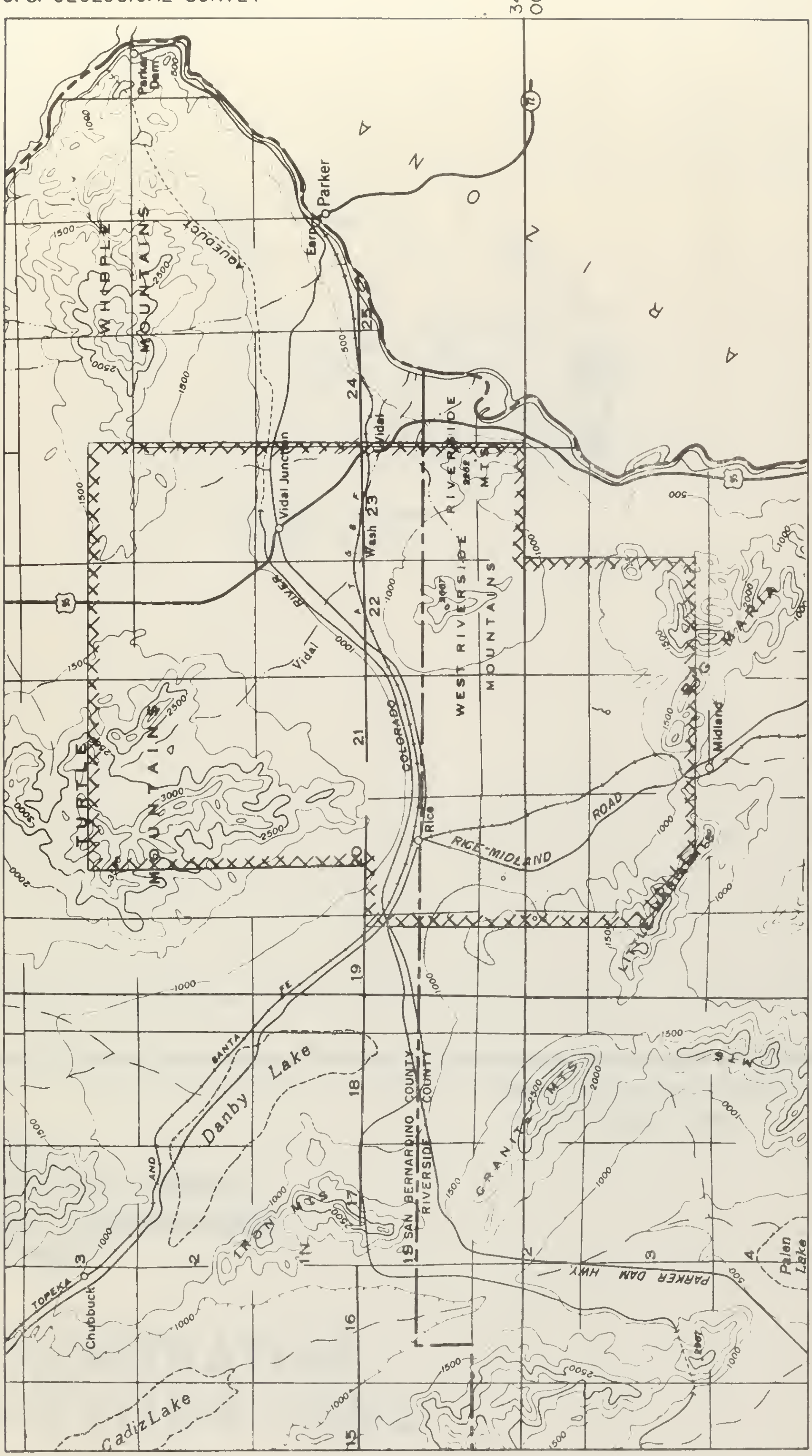
See footnotes at end of table.

Well number	2S/20E-16P1	2S/21E-28N1
Date of collection	10-30-17[1]	2-3-56
Results in parts per million		
Silica (SiO_2)	25	
Iron (Fe)	.80	
Calcium (Ca)	27	148
Magnesium (Mg)	7.2	37
Sodium (Na)	a191	390
Potassium (K)		5.2
Bicarbonate (HCO_3)	190	63
Carbonate (CO_3)	0	0
Sulfate (SO_4)	246	1,010
Chloride (Cl)	69	194
Fluoride (F)		1.8
Nitrate (NO_3)	2.3	2.0
Boron (B)		2.8
Dissolved solids		
Calculated	662	1,820
Residue on evaporation at 180°C	661	1,890
Hardness as $CaCO_3$	97	522
Noncarbonate hardness as $CaCO_3$		
Percent sodium		62
Specific conductance (micromhos at 25°C)		2,640
pH		7.8
Temperature (°F)		
Depth of well (feet)	233.0	500
Analyzing laboratory		DWR
Laboratory number		6631

1. Analysis from U.S. Geological Survey Water-Supply Paper 497, p. 280-281.

2. Calculated by the Ground Water Branch from hypothetical combinations.

3. Sampled with grab-sampler.



0 10 20 MILES

FIGURE 1.—Map of part of southern California showing area described by this report

Base map from U.S. Geological Survey topographic map of State of California, south half, scale 1:500,000

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

FEDERAL—STATE COOPERATIVE GROUND WATER INVESTIGATIONS
1963

EXPLANATION

UNCONSOLIDATED DEPOSITS

QUATERNARY

Recent

Qyo

Younger alluvium

Poorly sorted gravel, sand, clay, and silt, unconsolidated, commonly overlies older units as a thin veneer, largely above the water table, if saturated, probably yields water freely to wells

Qp

Playa deposits

Clay, silt and sand, unconsolidated, relatively impermeable, do not yield water readily to wells

Qs

Windblown sand

Sand, unconsolidated, actively drifting, locally anchored by vegetation, apparently above the water table and is not considered a water-bearing unit

Pleistocene

Qoo

Older alluvium

Sand, well sorted, interbedded with gravel, silt and clay, unconsolidated to poorly indurated, where saturated yields water freely to wells

Ql

Locustrine deposits

Clay, interbedded with well-sorted, very fine sand and silt, moderately indurated, locally dissected, may yield small amounts of water to wells

Qf

Fan deposits

Poorly sorted boulders, gravel, sand, silt, and clay, unconsolidated to moderately indurated, locally dissected, desert pavement locally well-developed, generally above the water table and, therefore, yield little water to wells

CONSOLIDATED ROCKS

TERTIARY(?) AND QUATERNARY(?)

Pliocene(?) and Pleistocene(?)

QTv

Volcanic rocks, undifferentiated

Lava flows, mainly basalt with some felsic volcanic rocks, virtually not water bearing

PRE-TERTIARY

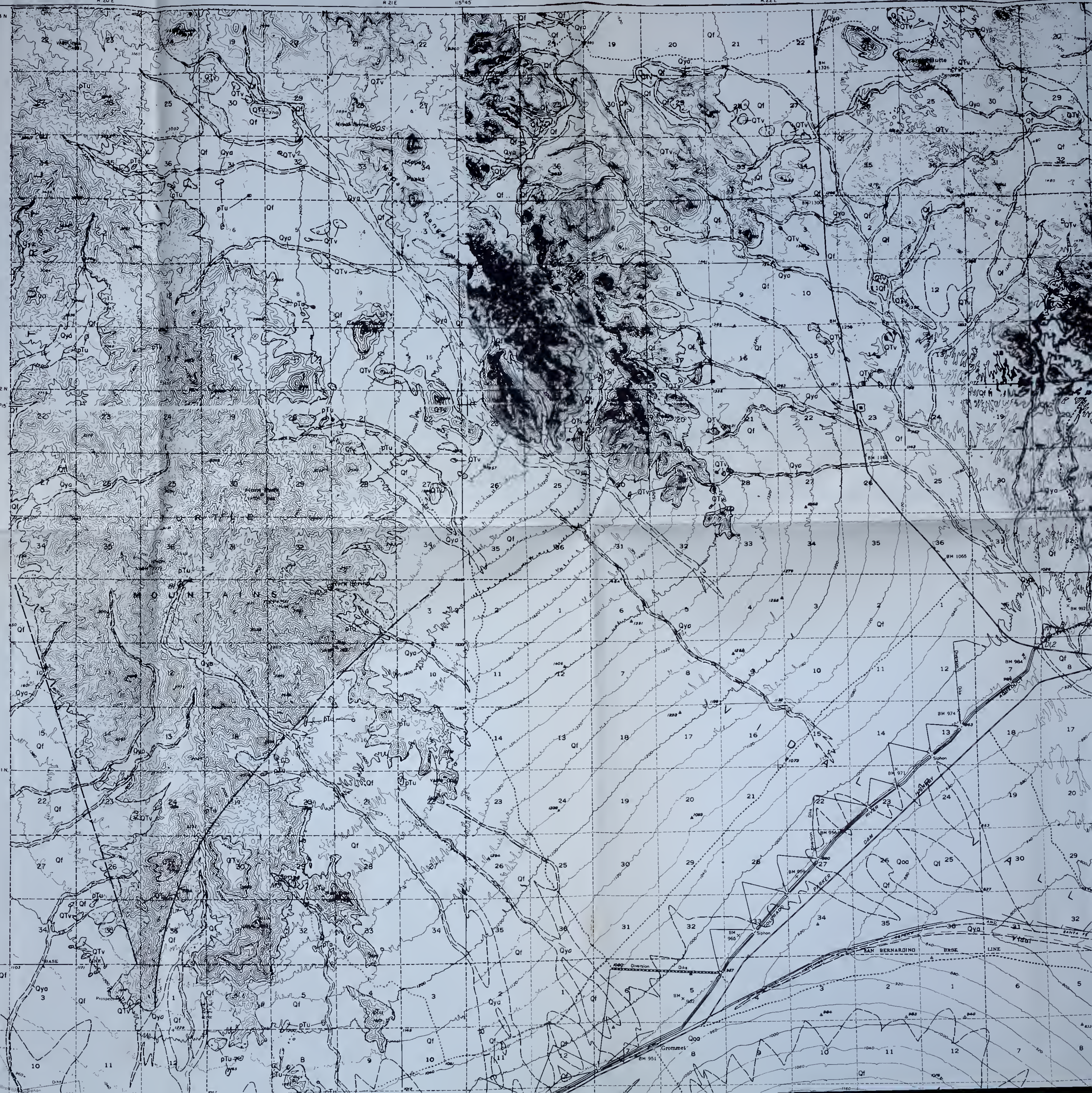
pTu

Basement complex

Metamorphic and igneous intrusive rocks of pre-Tertiary age, overlain in places by volcanic rocks of Tertiary(?) and Quaternary(?) age, virtually not water bearing except for minor amounts from cracks and residuum

MAP SYMBOLS

Contact



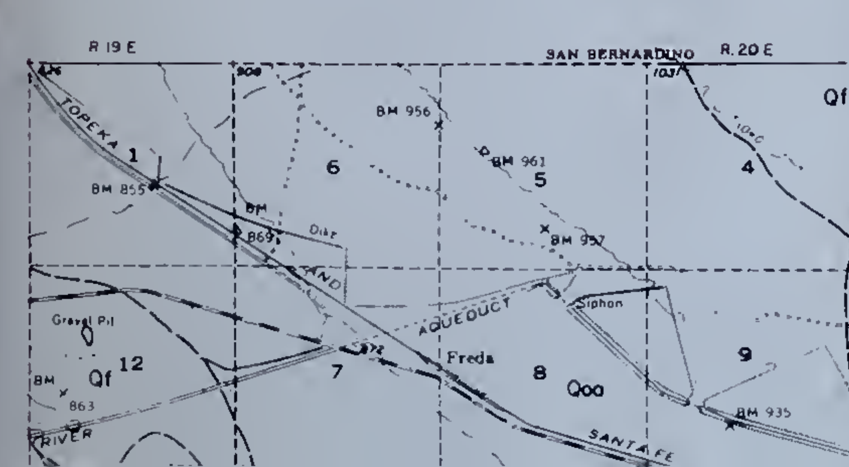
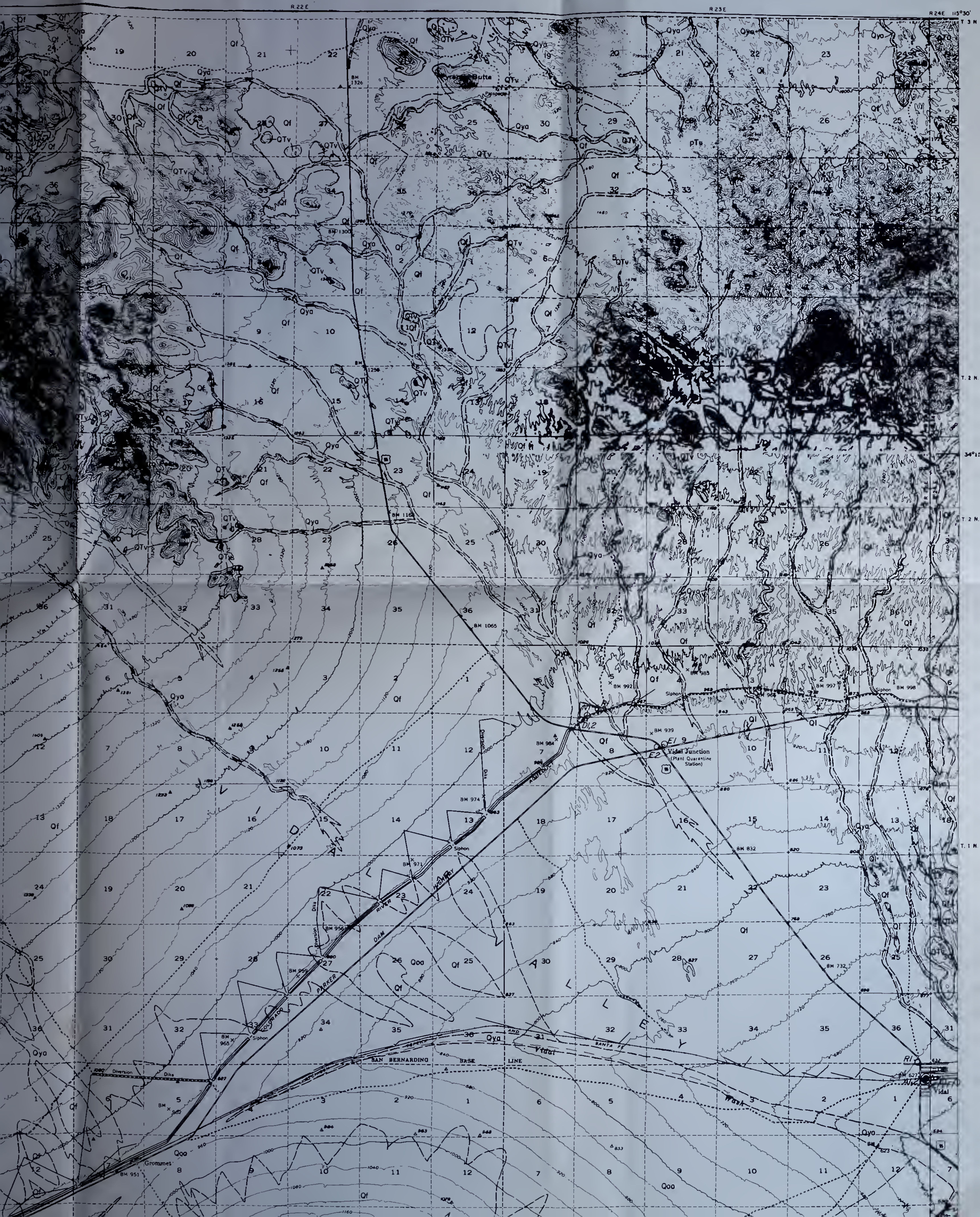


FIGURE 2


R.22E
R.23E
R24E 115°30'
T 3 N
T. 2 N.
T. 1 N.
Butte
Vidal Junction
(Plant Quarantine Station)
Siphon
Diversion
Dike
PARKER
DAM
SAN BERNARDINO
BASE
LINE
SANTA FE
Vidal
Wash
Grommet
VIDAL VALLEY

Fault
Dashed where approximately located; dotted where concealed

Shoreline with hachure on high side

E1
Domestic or unused well

A1,2
Well with pump rating of 5 horsepower or more

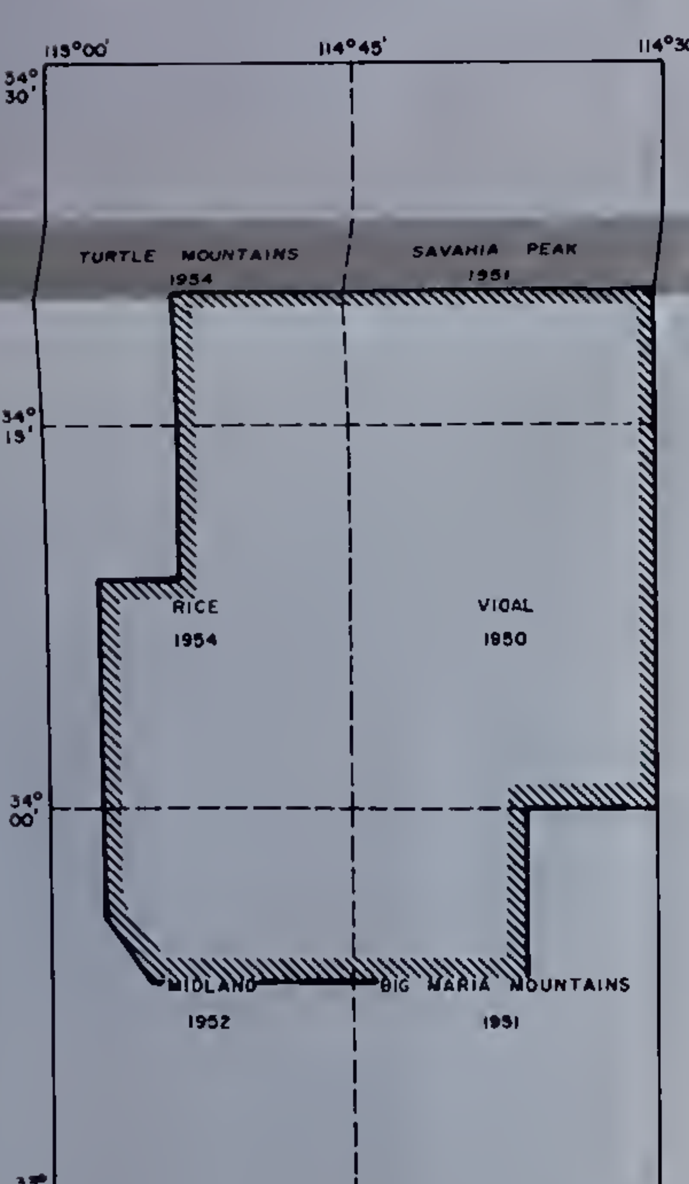
B1
Dry or destroyed well

MS
Spring

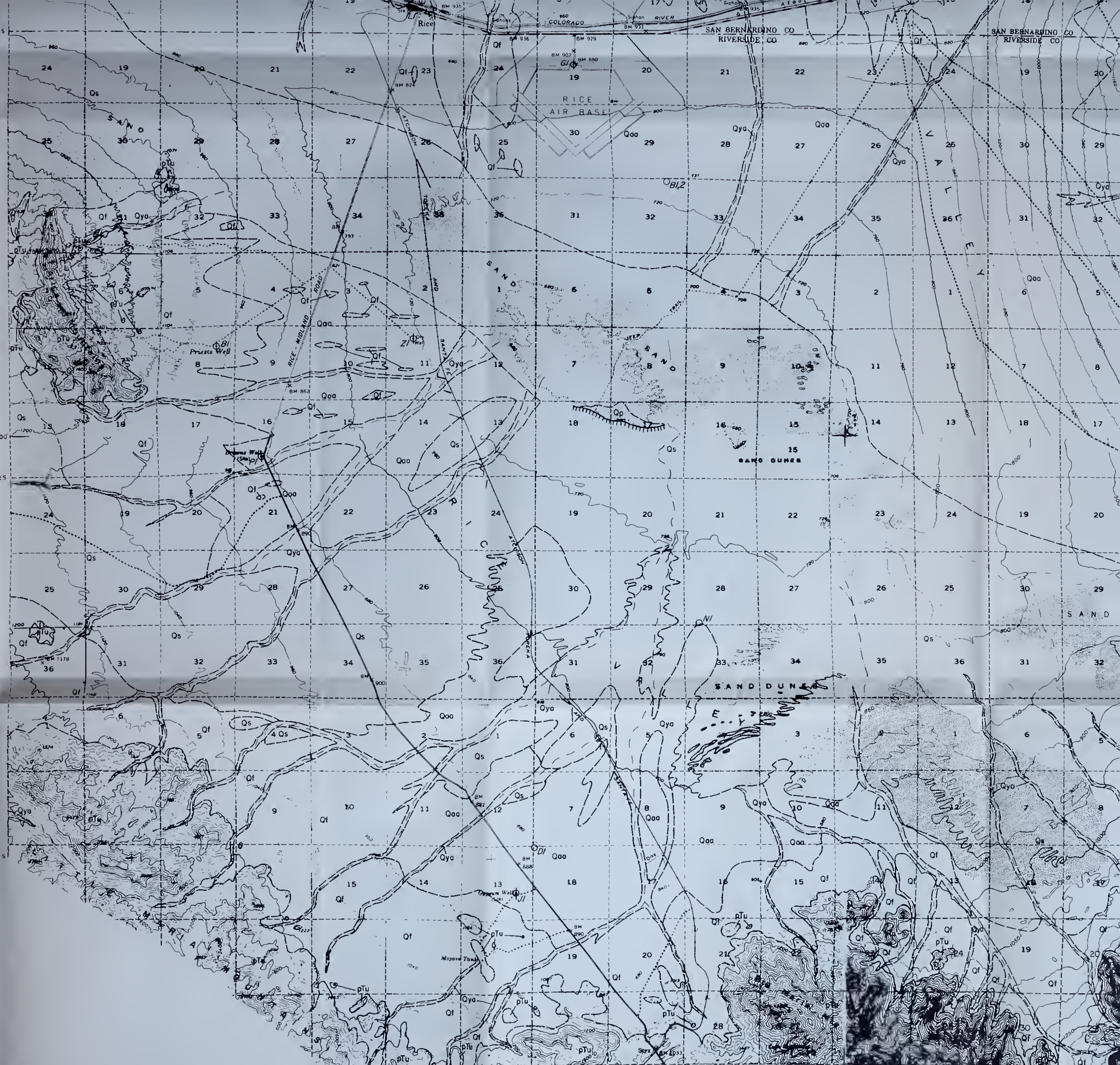
Letter next to well indicates position in section as shown below:

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

Letter 2 indicates the well was plotted from an unverified location description



INDEX TO TOPOGRAPHIC QUADRANGLE MAPS



Base from U.S. Geological Survey topographic maps, scale 1:62,500, 1962

BULLETIN NO. 91-8

MAP OF THE RICE AND VIDAL VALLEY AREAS, CALIFORNIA
SHOWING RECONNAISSANCE GEOLOGY AND LOCATION OF WELLS AND SPRINGS

SCALE 1:62500

CONTOUR INTERVALS 40, 50, AND 80 FEET
DATUM IS MEAN SEA LEVEL

Geology and location of wells by
F. W. Giessner, 1962

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

FEDERAL-STATE COOPERATIVE GROUND WATER INVESTIGATIONS

PREPARED BY U.S. GEOLOGICAL SURVEY
1963

15°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1962